(12) UK Patent Application (19) GB (11) 2 075 635 A

(21) Application No **8110560**
(22) Date of filing
3 Apr 1981
(30) Priority data
(31) **3017757**
(32) **9 May 1980**
(33) **Fed Rep of Germany (DE)**
(43) Application published
18 Nov 1981
(51) **INT CL³ F16D 3/16**
F16C 35/00
(52) Domestic classification
F2U 226 244 248 336 504 532 534 572
(56) Documents cited
GB 1539108
GB 1330313
GB 1143522
GB 807036
GB 415343
(58) Field of search
F2U
(71) Applicant
Löhr & Bromkamp GmbH
Muhlheimer Str 163
6050 Offenbach Main 1
West Germany
(72) Inventors
Hans-Heinrich Welschof
Rudolf Beier
(74) Agents
A B Cundy & B C Robertson
Guest Keen & Nettlefolds Limited
Group Patents and Licensing Department
Group Head Office
PO Box 55
Smethwick
Warley
West Midlands B66 2RZ

(54) Hub assembly

(57) An assembly comprising hub member 1, bearing means 3, 4 for supporting the hub member, and a universal joint member 5 through which the hub member can be driven, wherein the universal joint member is received within the hub member and a space 16 between these members is occupied by a filler material. The filler material provides a torque transmitting connection between these members. The filler material may comprise, for example, a hard rubber, soft solder, or a bonding agent such as an epoxy resin incorporating particulate material. The construction enables the assembly to be dismantled if required, and provides for heat insulation and vibration damping of the universal joint relative to the hub and bearing.

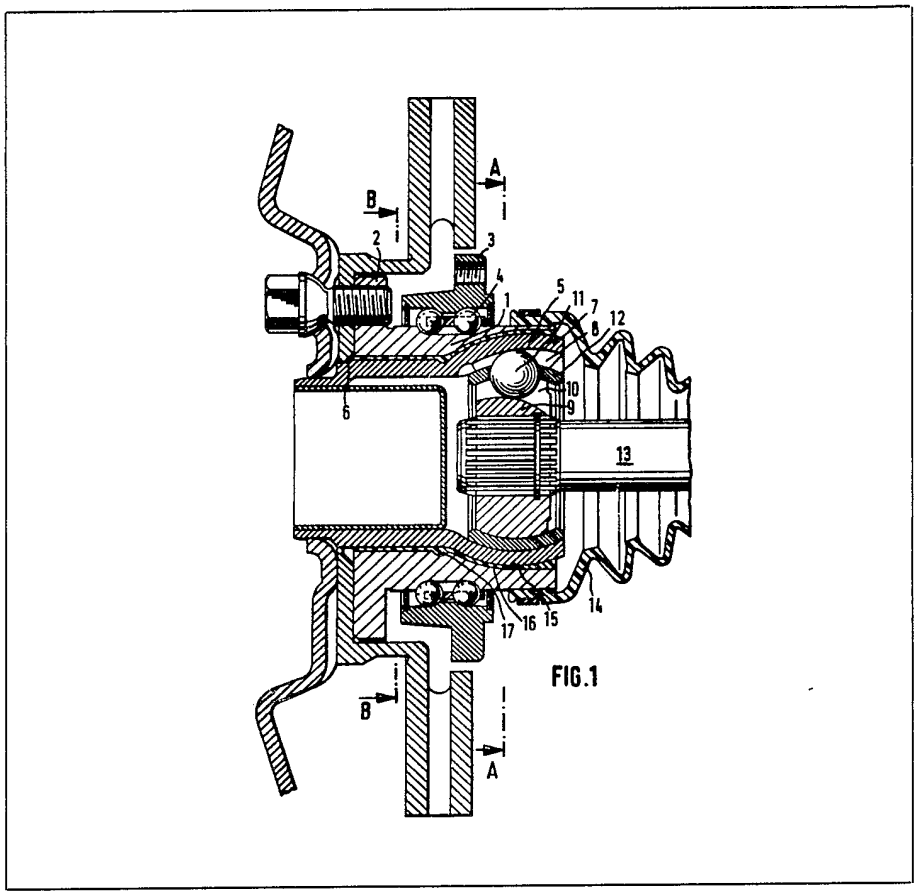

FIG.1

GB 2 075 635 A

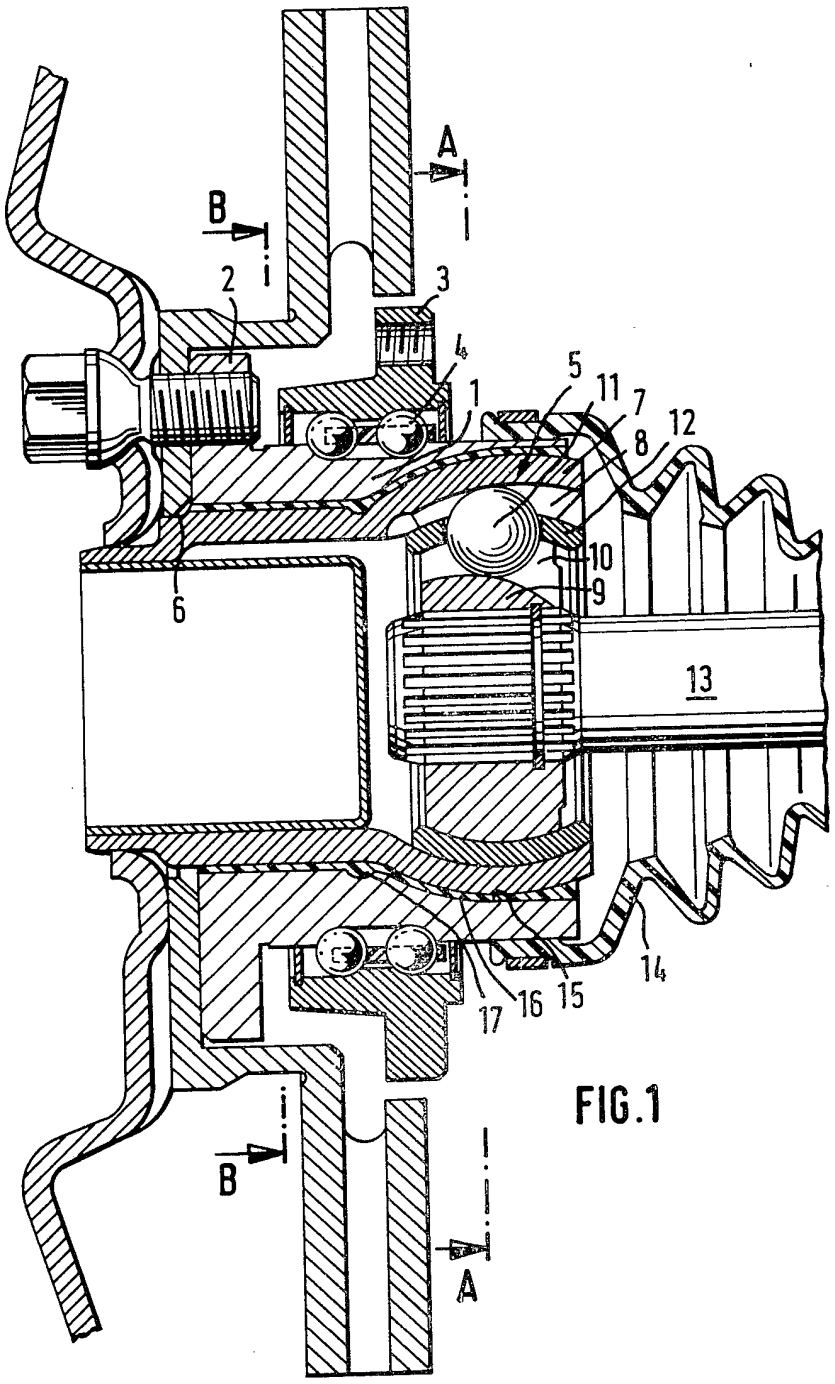

FIG.1

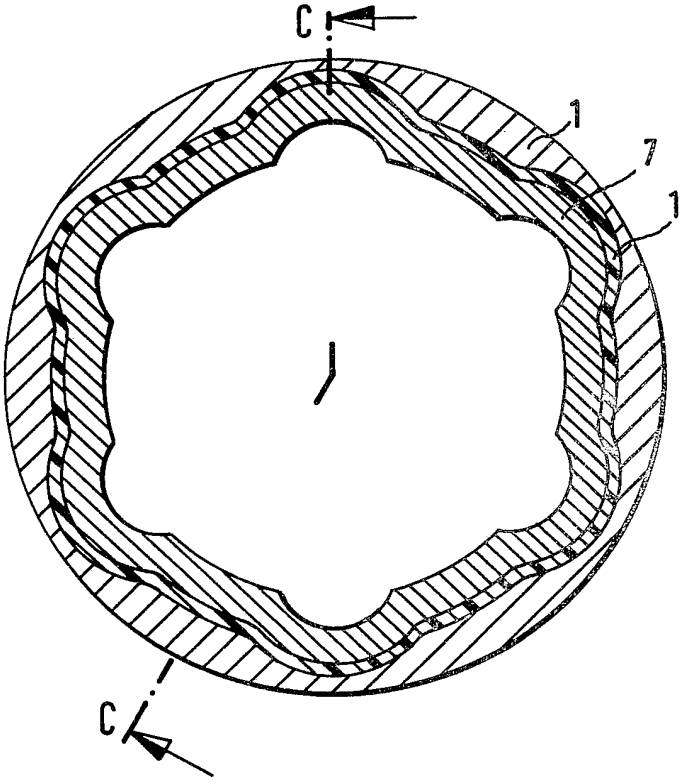

FIG.2

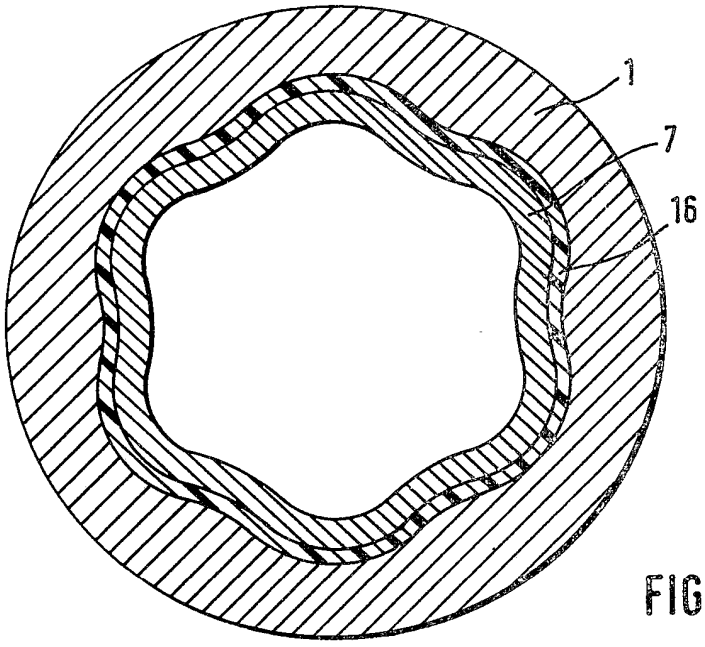

FIG.3

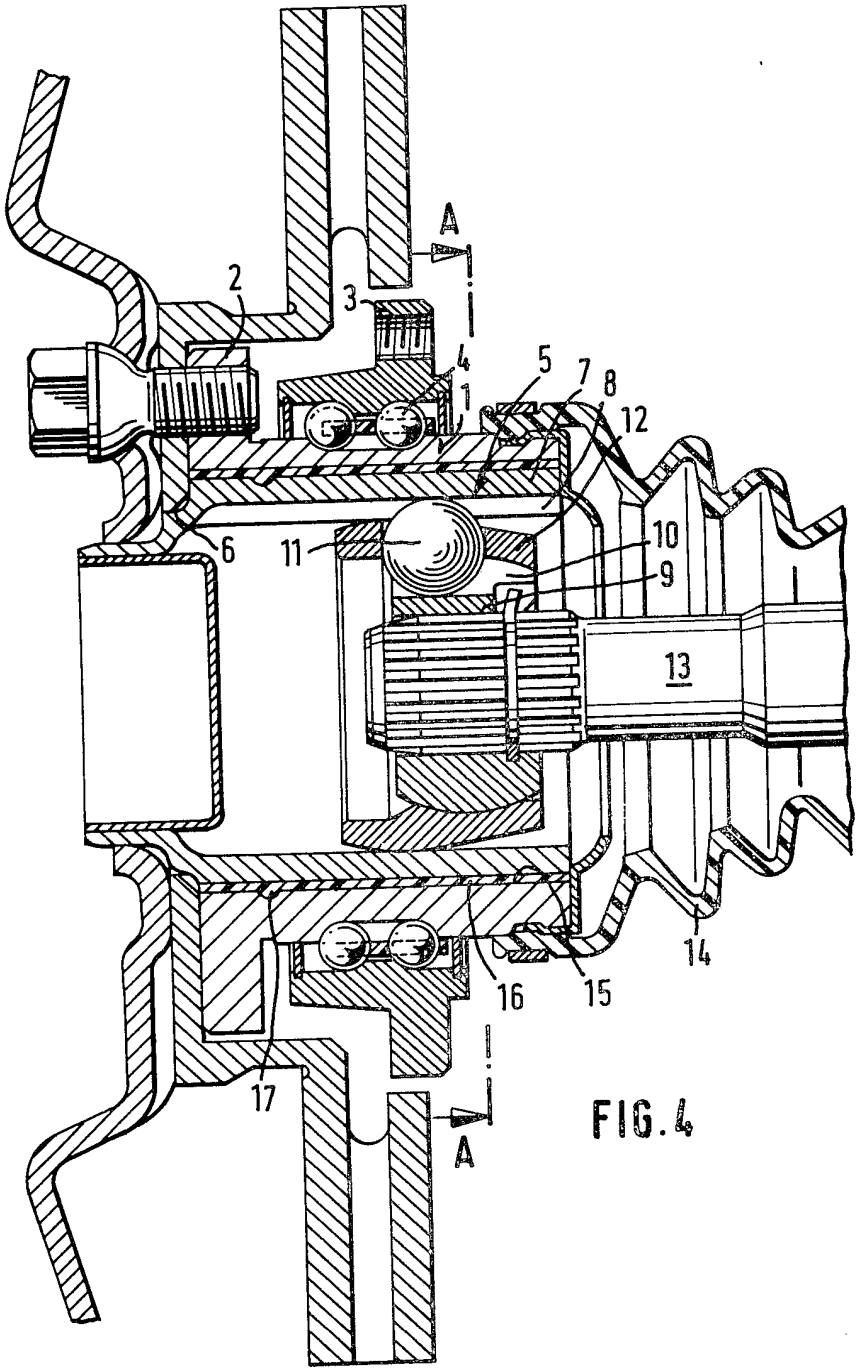

FIG.4

SPECIFICATION

Hub assembly

This invention relates to a hub assembly for a vehicle, comprising a hub member, bearing means for supporting the hub member for rotation, and a universal joint member through which the hub member can be driven.

One form of such hub assembly has been proposed in U.S. patent specification 3,944,011. In that assembly, the universal joint member is connected to the hub member (which also constitutes the inner race of a radial and axial bearing) by splines. This construction, however, has a disadvantage in that the splined connection necessarily occupies a certain amount of space, and in addition there is the problem that deformation of the joint member and development of heat in the universal joint may affect the bearing. The assembly can however be dismantled if the joint member or bearing requires replacement.

A further assembly is disclosed in U.S. patent specification 3,757,883. In this case, the universal joint member is press fitted into a bore in the hub member. Again, there is the risk of deformation of the joint member, under conditions of maximum articulation angle and/or maximum torque, affecting the bearing. In addition, the hub member reaches a high temperature because of heat transmitted to it from a brake disc, and such heat can be transferred to the universal joint.

It is the object of the present invention to provide an improved hub assembly.

According to the invention, we provide a hub assembly comprising a hub member, bearing means for supporting the hub member for rotation, and universal joint member through which the hub member can be driven, wherein the universal joint member is received with the hub member and a space between these members is occupied by a filler material which establishes a torque transmitting connection therebetween. Preferably the universal joint member has an outer surface which is of non-circular cross-section.

The bearing means may comprise inner and outer bearing members and a plurality of rolling elements therebetween, the inner bearing member also constituting said hub member.

An advantage of such a design is that the relatively expensive material required to form the inner race of a bearing is not required for the universal joint. It is possible to make the universal joint member, usually the outer member of a constant velocity ratio universal joint of the type in which torque is transmitted between inner and outer members by balls, from relatively thin tube or sheet metal. An outer joint member thus made essentially has a non-circular cross-section, which provides for effective torque transmission when it is received with the hub member and the intervening spaces filled by the filler material.

Machining of components can be reduced to a minimum, and tolerances need not be totally accurate.

The filler material may comprise a synthetic resin material, a hard rubber, or soft solder. If a suitable material is selected, it is possible to provide insulation against the transfer of heat between the hub member and joint member, and to produce a noise and vibration damping effect. The selection of filler material obviously depends on the conditions which have to be met by the individual assembly.

If replacement of one of the parts of the assembly is required, the connection between the joint member and hub member can be severed by suitable measures such as heating or pressing out.

The filler material may comprise a bonding agent incorporating particles of solid substance. Suitable solid substances may comprise ferrous chippings, aluminium chippings, sand, up to 80 or 80 per cent of the filler material. A suitable bonding agent for use in such a filler material would be an epoxy resin.

The internal cross-section of the hub member, in which the joint member is received, may have a non-circular cross-section corresponding to the outer cross-section of the joint member. This provides a measure of support for the joint member when it is transmitting torque.

Axial securement of the joint member and hub member may be provided by a circumferential groove in one or both of these members, with which the filler material keys.

The surfaces of the hub member and joint member which face one another may closely correspond in shape, to ensure good torque transmission.

The invention will now be described by way of example with reference to the accompanying drawings, of which

Figure 1 is a sectional view showing one embodiment of assembly according to the invention.

Figure 2 is a section on the line A–A of Fig. 1.

Figure 3 is section on the line B–B of Fig. 1.

Figure 4 is a sectional view showing a further embodiment of assembly according to the invention.

The assembly illustrated in Fig. 1 comprises a hub member 1, terminating in a flange 2. The hub member 1 also constitutes the inner race of a double row radial and axial ball bearing, with an outer race 3 and balls 4. At its flanged end, the hub member has fitted to it a brake disc 6, and receives a wheel held by suitable bolts.

The hub member is hollow, and receives a constant velocity ratio universal joint 5 of the

type comprising a joint outer member 7, an inner member 9, and a plurality of balls 11 received in grooves 8, 10 in the outer and inner members for torque transmission between these members. The balls occupy apertures in a cage 12 of annular form received between the outer and inner joint members 7, 9, and the shape of the grooves in the joint members is such that the balls occupy the plane by secting the angle between the rotational axis of the outer and inner joint members when the joint is bent, thereby affording constant velocity ratio running characteristics to the joint. The inner joint member has a splined end of a drive shaft 13. A bellows type of sealing boot 14 keeps lubricant within and excludes dirt from the joint.

The outer member 7 of the univesral joint 5 fits in the internal cavity 15 of the hub member 1 with a gap or space 16 between these components. This space is occupied by a filler material, which filler material has been cast into the space after the components have been placed together. The filler material secures the components together for torque transmission, and an annular groove 17 in the hub member, and a corresponding groove in the joint outer member, with which the filler material keys, secures the joint member axially in the hub member.

Fig. 2 shows a section along the line A–A of Fig. 1. It illustrates that both the outer joint member 7 and hub member (inner bearing member) 1 have a non-circular cross-section. This, with the support of the filler material in space 17, ensures satisfactory transmission of torque between these components.

Fig. 3 shows a section along the line B–B of Fig. 1. Here, too, the cross-section of the outer joint member and hub member is non-circular. The filler material acts as vibration absorber and heat insulation between the components.

Fig. 4 shows an assembly which is similar to that of Fig. 1, and like parts are designated by the same reference numerals. In this case, however, the hub member (inner bearing member) 1 has a cylindrical opening, and the universal joint is of the type able to accomodate relative axial movement (plunge) between its inner and outer members. Universal joints of other types could be used in an assembly according to the invention.

The filler material may comprise, as referred to above, a hard rubber, soft solder or a suitable synthetic resin. It could comprise a bonding agent such as an epoxy resin, incorporating particles of a solid substance such as ferrous or aluminium chippings or sand.

In addition to the advantages referred to above of vibration damping and heat insulation, the assembly according to the invention does not place exceptionally high requirements on the accuracy of machining of the hub member and joint outer member. Proper centering of these components relative to one another can be achieved by appropriately positioning these components prior to introduction of the filler material. The invention also renders it possible to have the joint outer member formed from a sheet metal or tube stock since it is supported by the filler material when in use enabling it to be of relatively thin walled contruction.

CLAIMS

1. A hub assembly comprising a hub member, bearing means for supporting the hub member for rotation, and a universal joint member through which the hub member can be driven, wherein the universal joint member is received within the hub member and a space between these members is occupied by a filler material which establishes a torque transmitting connection therebetween.

2. A assembly according to claim 1 wherein the universal joint member has an external cross-sectional shape which is not circular.

3. An assembly according to claim 1 or claim 2 wherein the bearing means comprises inner and outer bearing members and their plurality of rolling elements therebetween, the inner bearing member also constituting said hub member.

4. An assembly according to any of claims 1 to 3 wherein said filler material comprises a synthetic resin material, hard rubber, or soft solder.

5. An assembly according to any one of claims 1 to 3 wherein said filler material comprises a bonding agent incorporating particles or a solid substance.

6. An assembly according to claim 5 wherein said solid substance comprises ferrous or aluminium chippings or sand.

7. An assembly according to any one of the preceding claims, wherein the cross-sectional shape of the interior of the hub member is non-circular.

8. An assembly according to any one of the preceding claims wherein said hub member and/or universal joint member has a circumferential groove with which said filler material keys to effect axial securement of said members.

9. An assembly according to any one of the preceding claims wherein the facing surfaces of the hub member and universal joint member correspond closely to one another in shape.

10. An assembly according to claim 9, wherein said universal joint member is made of a sheet material.

11. An assembly substantially as hereinbefore described with reference to and as shown in Figs. 1 to 3, or Fig. 4, of the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.